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**An analysis of the impact of housing policies on housing
prices in South Korea**

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April, 2014

Martin School of Public and Administration

Capstone Project

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Executive Summary

The South Korean government has been intervening in the housing market for a long time to either activate or stabilize housing prices. However, there is a controversy about the effect of housing policy in South Korea. I analyzed the effect of housing policies as well as other factors (interest rate, cost of renting, inflation, stock price, unemployment rate, exchange rate) on housing prices nationally as well as in northern Seoul and in southern Seoul, from January 2000 to January 2015 (181 months of data).

According to the results of my regression analysis to test the effect of housing policies, there is no statistical evidence that housing policies have effects on housing prices. The pattern is the same across all three estimations (national, northern Seoul, southern Seoul). The attempt of the South Korean government to cool the overheated housing market never seems to have the desired negative effect. The efforts of the South Korean government to heat the depressed housing market never seems to have the intended positive effect, either. This research finds no useful effect of these policies.

Looking at other factors, the results are very similar across all three estimations (national, northern Seoul, southern Seoul). The cost of renting has a large, statistically significant positive effect in all cases. The unemployment rate has a large, statistically significant negative effect nationally. Both effects are larger in southern Seoul than in northern Seoul. The interest rate matters only in northern Seoul, while the stock prices matter only in southern Seoul. Less wealthy people live in northern Seoul, whereas wealthier people live in southern Seoul. Interest rates matter more to the former and stock prices matter more to the latter.

1. Introduction

South Korea is one of the most densely populated countries. The total area of South Korea (30,874 square miles) is smaller than that of Kentucky (40,409 square miles), but its population (50.4 millions) is ten times as large as Kentucky's (4.4 millions) (National Statistics office of Korea & U.S. Census Bureau). In addition, most of the population lives in a highly concentrated area. Seoul, the capital of South Korea, houses almost a quarter of the South Korean population. At the same time, 86 percent of South Korea consists of farmland and mountains, leaving a very limited area of land available for housing. (Lee, 2008) Most South Korean people are very sensitive to the change of housing prices.

When housing prices go up, increasing numbers of South Koreans demand housing price controls because they fear they will not be able to buy a home. Conversely, when housing prices goes down, some South Koreans ask for a government stimulus to activate the housing market. People will reduce their consumption as their wealth decreases because "the house comprises the largest proportion of their assets" (Ryu, 2004, p.24). The South Korean government is afraid that such a reduction of consumption will lead to a national economic recession. The change of housing prices has been always a big issue in South Korea. Consequently, the South Korean government has intervened in the housing market by using various means to either cap housing prices or activate the housing market for a long time. Housing policy objectives, types of housing policy, and policy instruments are shown in Table 1.

Table 1. Objectives of housing policy and instruments¹

Objectives	Types	Instruments	Expected effects on housing prices
Housing market stabilization	Reinforcement of tax system	Increasing housing acquisition tax or housing possession tax, and so on	Negative (-)
	Reinforcement of financial regulation	Putting a greater limitation on mortgage, increasing interest rate, and so on	Negative (-)
	Reinforcement of transaction regulation	Housing transaction reporting system, Designating a zone of overheated speculation, and so on	Negative (-)
	Reinforcement of development regulation	Price cap on apartment, Tightening regulations on redevelopment, and so on	Negative (-)
Housing market activation	Relaxation of tax system	Housing acquisition tax or housing possession tax cuts, and so on	Positive (+)
	Relaxation of financial regulation	Relaxing restrictions on mortgage, Lowering interest rate, and so on	Positive (+)
	Relaxation of transaction regulation	Abolishing housing transaction reporting system, Lifting a zone of overheated speculation, and so on	Positive (+)
	Relaxation of development regulation	Mitigating regulation on redevelopment, Free housing pricing, and so on	Positive (+)

Housing prices greatly increased in 2006, even as the South Korean government enacted many housing policies for housing market stabilization. Following the global financial crisis in 2008, precipitated by the Lehman Brothers bankruptcy in September 2008, housing prices steadily fell (Kim, 2013). Because housing prices had steadily fallen, an increasing number of voices were calling for deregulation. The South Korean government finally implemented a policy to activate the housing market on Aug. 1st, 2014 by lowering the standard interest rate (from 2.50 → to 2.25 percent) and relaxing the restrictions on mortgage lending². Nevertheless, there has not been a substantial increase in housing prices so far.

¹ Table 1 was edited from Ham & Son (2012, p.2)

² The South Korean government increased LTV(Loan To Value): from 50 → to 70 percent

Why is there not a change in housing prices despite the recent housing policies? Even though government has intervened in the housing market to activate or stabilize the housing market, there were so many criticisms that housing policies had not contributed to the activation of the house market or the stabilization of housing prices. Maybe the reason is that housing prices in South Korea are affected by many other variables, jeonse³, composite stock index, unemployment rate, and so on, rather than housing policies. If the jeonse rises, people may try to buy the house because they have a larger burden to pay the deposit. And if the composite stock index goes up, people will have smaller burden when they intend to buy the house because their wealth increases. On the other hand, if unemployment rate rises, people may be reluctant to buy the house because their income decreases. And if the exchange rate (the ratio of Korean money to 1 dollar) goes down, there is the possibility that housing prices will go down because it means that an influx of foreign capital into Korea is getting smaller.

So, I analyze the impact of housing policies on housing prices in three aspects by regression model. First, how are housing prices affected by housing policies? Second, how are housing prices affected by other variables except housing policies? Finally, is there time lag until housing policies affects housing prices? I will focus on housing prices not only for South Korea as a whole but also separately for Seoul because housing policies have mainly targeted at Seoul. Seoul will be divided into two parts, northern Seoul and southern Seoul, which are separated by the Han River. The Korean government has dealt differently with these two parts because characteristics of housing prices in two parts are different each other.

³ The jeonse is the unique rental system of South Korea. Tenants provide landlords with a deposit, typically between a quarter and half of the property's value, to invest for the duration of the lease instead of paying monthly rent. Landlords return the deposit to tenants at the end of the tenancy. (The Economist, Feb. 15th 2014)

2. Literature Review

There have been many studies about the impact of housing policies on housing prices in the U.S. since the housing boom (the mid-2000s) and the world financial crisis (2007-2009). Jarocinski and Smets (2008) tried to review the relationship between the housing market and monetary policy in the U.S. They stated that there was evidence that monetary policy has significant effects on housing prices. “Easy monetary policy designed to stave off perceived risks of deflation in 2002-04 contributed to the boom in the housing market in 2004 and 2005.”(p.24) On the other hand, Bernanke (2010) insisted that the magnitude of the past decade’s housing boom in the U.S. is too large to be explained by the stance of monetary policy alone.

More specifically, there have also been many studies about the relationship between interest rates and housing prices in the U.S and two different opinions about the relationship. Mayer & Hubbard (2008) analyzed the role of interest rates, the mortgage market, and other fundamental factors in United States housing markets. According to the result of their analysis, changes in interest rates had played a large role in the United States housing boom. Result of regressions showed that there was a statistically significant relationship between the user cost⁴ and the change in house prices.

On the other hand, Kuttner (2012) drew a different conclusion. He stated many studies were based on the hypothesis that interest rates had a significant effect on housing price, but a more careful examination of data yielded little support for this hypothesis. He tried to analyze interest rate and housing prices by time-series analysis. According to the result of his analysis,

⁴ The user cost means the after-tax cost of owning a home

the impact of interest rates on house prices was not great. “The estimated effects are too small to explain the previous decade’s estate boom in the U.S. and elsewhere.”(p.22) He stated that historically interest rates declines tended to precede periods of house price appreciation.

There have also been many studies about the relationship between mortgage and housing prices. Michael, Major and Vandell (2008) tried to analyze the relationship between subprime lending and the housing bubble in the U.S. by using a cross-sectional time-series approach. They argued that existence of subprime loan products alone did not merit primary blame for the housing bubble and political and regulatory actions, which led to a disruption in traditional flows of credit into market, also contributed to the housing bubble.

Lindner (2014) tried to analyze the relationship between mortgage credit and housing values in the U.S. According to the result of his analysis, mortgage credit drove housing prices and not vice versa. He insisted that monetary policy was not likely to play a large role in the built-up of the housing bubble.

There have also been a few studies about the impact of housing policies on housing prices in South Korea. Ko & Park (2010) analyzed the past government’s real estate policy and the time-series data on real estate price index from 1986 to 2009, a period of 24 years. As a result, first, South Korea’s real estate policy was the post-policy. It means that the South Korean government had not executed real estate policy on time and took action only after real estate prices were an issue. And the past government’s real estate policy was inconsistent with each other. Second, the past government’s real estate policy had an insignificant effect on real estate market considering the strength of real estate policy. Third, the timing and

means of policy enforcement was inappropriate and real estate market was getting worse whenever real estate policies were implemented.

Jo & Kim (2012) examined the effects of housing policy which is uniformly implemented all over the country. They suggested a plan to improve the effectiveness of housing policy. “As a result, housing policy was not effective because housing prices were not affected as the government intended.”(p.1) They suggested that the government has to implement housing policy correctly and timely.

Cho (2004) tried to analyze the relative housing prices – sales and jeonse rates – by using a simple general-equilibrium growth model and a theoretical model that explained the determination of housing prices. According to the result of his analysis, the relative price of sales to jeonse depended on the ratio of inflation to real interest rates. So, “even when the monetary authority maintains a pre-announced target level of inflation rate, the relative price of sales to jeonse rises if the real interest rate declines.”(p.19)

3. Research Design

3.1 Research questions and hypothesis

The research questions and hypothesis of this study are as follows

Question 1: Were housing prices affected by housing policies?

Hypothesis 1: If government executes policies for activating the housing market, housing prices will go up.

Hypothesis 2: If government executes policies for stabilizing the housing market, housing prices will go down.

Recently, the South Korean government has been trying to activate housing market by lowering the standard interest rate and relaxing the restrictions on mortgage lending. However, the mass media in South Korea are reporting that there are no changes in housing prices regardless of recent housing policies for activation, raising questions about the effectiveness of the current housing policies.

Question 2: Were housing prices affected by factors other than housing policies?

Hypothesis 3: If jeonse, the consumer price index (hereafter “CPI”), and stock prices increase, housing prices will go up.

Hypothesis 4: If standard interest rate, unemployment rate, and exchange rate increase, housing prices will go down.

The mass media in South Korea are reporting that there is no change in housing prices, whereas the jeonse (deposit) continues to go up regardless of recent housing policies of government. It is said that people will intend to buy a house because the gap between housing prices and the jeonse (deposit) will decrease if the jeonse go up and housing prices are stagnant. The question of whether housing prices and the jeonse will really go in the positive direction from past experience is raised. If there is inflation (CPI increase), nominal housing prices will go up. And there is a general belief that housing prices will go up because people's wealth increase together if stock prices increases. On the other hand, if standard interest rates increase, people will be reluctant to buy a house because the interest burden increases when

they buy a house. Most Korean people rely on a mortgage when they buy a house. Housing prices will go down because people's income decreases if the unemployment rate increases. And if the Korean won appreciates relative to major foreign currencies, housing prices will go down because foreigners' purchases of houses in South Korea decrease.

Question 3: Is there a time lag until housing policies have an impact on housing prices after they are executed?

If housing policies have no impact on housing prices at that time that they are executed, do they have an impact on housing prices over a period of time after they are executed?

3.2 Variables (data set)

The object of this study is to analyze empirically how many factors including housing policies affect housing prices. The model used the change in housing prices nationally, or in northern Seoul, or in southern Seoul from January 2000 to January 2015 using 181 months of data. In each case, the change in housing prices is regressed on the standard interest rate, the change in the jeonse rate, the change in CPI, the change in the stock price, the unemployment rate, the change in the exchange rate, quarter of the year (first quarter omitted, and second, third, and fourth quarters compared to the first quarter), and policies aimed at heating the housing market (activation policy), and cooling the housing market (stabilization policy)⁵. In the model, policies are lagged on the assumption that effects should be delayed a month.

⁵ The month a policy goes into effect is expressed in dummy variables. It will be measured as a time lag when a policy goes into effect after a policy is executed.

The increase rate of housing prices index⁶, not housing price, is selected as the dependent variable because it is very difficult to compare an absolute price of housing. In the case of jeonse, it is the same. A synthesis of prior research led to the selection of the standard interest rate, jeonse, CPI, the stock price, the unemployment rate, and the exchange rate as independent variables. Policy variables were divided into two types, dummyu and dummyd, because Korean government has repeatedly executed policies for housing market stabilization and housing market activation according to the situation of housing market..

Table 2. Description of variables

Variable		Description
Dependent variable	Increase rate of housing price index 1	The difference rate in monthly change of housing price index in the whole country
	Increase rate of housing price index 2	The difference rate in monthly change of housing price index at northern Seoul
	Increase rate of housing price index 3	The difference rate in monthly change of housing price index at southern Seoul
Explanatory and control variables	Standard Interest rate	Interest rate that is used as a criterion when financial institutions have dealings
	Increase rate of jeonse index	The difference rate in monthly change of jeonse index

⁶ Index that Kookmin Bank computes on the base of March 2013 = 100.0 after investigating the housing prices of the whole country (Glossary of terms in real estate)

	Increase rate of CPI	The difference rate in monthly change of CPI
	Unemployment rate	Ratio of unemployment to economically active population
	Increase rate of the composite price index of stocks	The difference rate in monthly change of the composite price index of stocks
	Increase rate of exchange rate	The difference rate in monthly change of exchange rate
Dummy (policy) variables	Dummyu	If Korean government executed policy for activating housing market, it is expressed as “1”, and if Korean government did not execute, it is expressed as “0”.
	Dummyd	If Korean government executed policy for stabilizing housing market, it is expressed as “1”, and if Korean government did not execute, it is expressed as “0”.

3.3 Analysis materials

Data used for this study were collected from various sources. Data about the increase rate of housing prices index and that of ‘jeonse’ index were collected from Koomin Bank, one

of the largest banks in South Korea. Kookmin Bank has evaluated them monthly⁷. Many banks in South Korea have used these data when they offer mortgages. Data about the standard interest rate were collected from the Bank of Korea, the central bank of Korea. The Bank of Korea reviews the comprehensive economic situation of Korea monthly and decides the standard interest rate that applied to the transaction among the financial institutions. Data about CPI and the unemployment rate were collected from the National Statistical Office. Data about the composite stock price were collected from Korea Stock Exchange. And data about the exchange rate were collected from Ministry of Strategy and Finance. Data about housing policies were quoted from housing policies classification used at 'An Empirical Study on the Policy Lag in the Housing Policy (Jo & Kim, 2012)' from January 2000 to December 2009. The author made them from January 2010 to January 2015 considering materials (housing policies) Korean government announced.

3.4 Test of time trends (unit roots)

The first task is to test for time trends (unit roots) to verify the appropriateness of using these variables in a regression. If two unrelated variables with time trends (unit roots) are regressed on each other, there will be a strong but spurious association between them. Of the eleven variables, nine reject a time trend as seen in table 3. Only the standard interest rate, which was trending down, and the change in CPI, which was trending down with a great variability, had time trends. However, neither is the dependent variable, and no problem is

⁷ After Kookmin Bank decide sample according region and type of house, house agent designated by Kookmin Bank input data online when sample house is traded (Kookmin Bank website)

created as the data have already been defined as changes. No further alteration of the data by differencing is required.

table 3. Results of time trends test

Variable	Test Statistic	Critical Value			p-value
		1%	5%	10%	
Increase rate of housing prices index(nationally)	-4.872	-3.483	-2.885	-2.575	0.0000
Increase rate of housing prices index (northern Seoul)	-4.606	-3.483	-2.885	-2.575	0.0000
Increase rate of housing prices index (southern Seoul)	-5.493	-3.483	-2.885	-2.575	0.0000
Standard interest rate	-0.795	-3.483	-2.885	-2.575	0.8205
Increase rate of jeonse index	-5.183	-3.483	-2.885	-2.575	0.0000
Increase rate of CPI	-2.330	-3.483	-2.885	-2.575	0.1626
Unemployment rate	-5.243	-3.483	-2.885	-2.575	0.0000
Increase rate of stock prices	-12.744	-3.483	-2.885	-2.575	0.0000
Increase rate of exchange rate	-14.498	-3.483	-2.885	-2.575	0.0000
Dummyd	-7.589	-3.483	-2.885	-2.575	0.0000
Dummyu	-10.698	-3.483	-2.885	-2.575	0.0000

3.5 Autocorrelation

There is a possibility that the residuals from a regression will be correlated. It is necessary to measure and control autocorrelation because it can be the cause of bias in estimating a regression coefficient. Economic markets find equilibrium from demand and supply, but markets differ in the speed with which they approach the equilibrium price. Some

markets are slow, like labor markets, some are fast, like stock markets, but actual markets take some amount of time. This is a study of the housing market. In estimating a regression with time series, after including the explanatory variables, here the jeonse rate along with some other variables, the model also include a shock usually called epsilon (ϵ). That summarizes random shocks and other omitted factors. After estimation, the Durbin-Watson statistic tests whether the estimated random shocks are independent from month to month. In the present estimation, they are not independent. That means that the housing market is still reacting next month to random shocks this month. If that is the case, then the model is adjusted by estimating their correlation (here, a rather large correlation of 0.714), and then the regression is re-estimated⁸. If there is a random change to the housing market from the economy, the housing market takes at least two months to account for it. That means that changes last month are still related to changes this month. In the model, this is reflected in the autocorrelation coefficient between consecutive months. If that is not included, then the estimation of effects and testing them might be biased. Of course, more than two months might be required, but here the results seemed insensitive to longer periods. So the Korean housing market takes about two months to find equilibrium.

4. Analysis and findings

4.1 Effect of housing policies: Research question 1

Looking at summary statistics, the biggest difference observed is that the housing market in southern Seoul is more volatile. The variance in southern Seoul is twice as high as

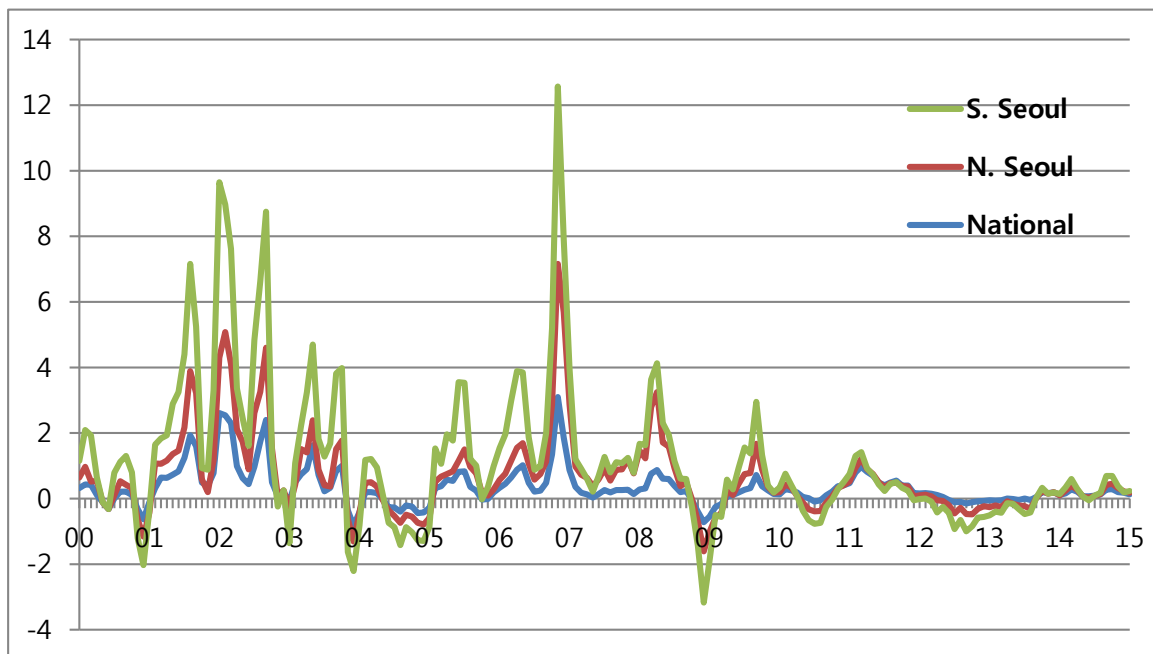
⁸ The technical name is Prais-Winsten estimation (Stata's prais command)

in northern Seoul. Housing prices also rose faster in southern Seoul. The national market is less volatile but similar to northern Seoul. The clear implication is that housing in southern Seoul has been subject to large, variable changes in housing prices.

Table 4. Summary statistics⁹

Variables	D of Housing prices			Interest rate	D of Jeonse	D of CPI	Unem. rate	D of Stock price	D of Exch. rate
	National	N. Seoul	S. Seoul						
Mean	.34	.31	.47	3.57	.42	2.85	3.53	.00	.00
Std. Dev.	.58	.69	1.06	1.01	.70	1.08	.51	.06	.03
Min	-.83	-.9	-1.6	2	-1.18	.8	2.7	-.23	-.14
Max	3.1	4.1	5.4	5.25	2.9	5.9	5.5	.22	.14

Figure 1. The change in housing price from January 2000 to January 2015



⁹ D at the table means increase rate (hereafter “D”) and unem means unemployment.

The policy in the same month as the house price change is positively correlated because that is the point of the policy - faster increases are associated with stabilization policy, the attempt to cool the market.

Housing policies do not have statistically significant effects on housing prices according to the results of the regressions. There is no difference across all three estimation (national, northern Seoul, southern Seoul). The South Korean government has consistently enacted many policies to activate the housing market since 2008. However, there is no evidence that the housing market is activating until now. The criticism can be true that housing policies have not activated or stabilized housing market but have been one of factors that disturbed housing market to some extent. The housing market could get worse whenever housing policies performed because the timing and means of housing policies was inappropriate as Ko & Park (2010) pointed out.

Table 5. Results of regression in evaluating the effects of housing policies

Variables	Estimated coefficient (p-value)				
	Dummyu L1.	Dummyd L2.	Quarter2	Quarter3	Quarter4
Whole country	-.0595 (0.175)	.1141 (0.053)	.0526 (0.513)	-.0035 (0.968)	-.0458 (0.584)
Northern Seoul	.0198 (0.723)	.1130 (0.135)	.0651 (0.529)	.0664 (0.568)	.0129 (0.904)
Southern Seoul	-.1510 (0.128)	.1852 (0.159)	.1498 (0.403)	.1319 (0.512)	-.0883 (0.637)

In addition, Granger Causality (hereafter “G-C”)¹⁰ was tested to look into the causality of housing policies and housing prices. The results of test show that there is no evidence of any G-C in any case of the 12 cases. The smallest p-value among the 12 tests is 0.324, very far from the 0.05 required to find G-C. There is no support for either housing policies predicting housing prices (outcomes) or housing prices (outcomes) predicting housing policies. There is no G-C here. Results of G-C test are not different from those of regression.

Table 6. Results of G-C test

	G-C tests (all t-tests with p-values)			
	Policies G-C prices		Prices G-C policies	
	t-test	p-value	t-test	p-value
National price-policy(cooling)	-0.29	0.770	-0.99	0.324
National price-policy(heating)	-0.99	0.325	<0.01	0.998
N.Seoul price-policy(cooling)	-0.10	0.921	-0.42	0.674
N.Seoul price-policy(heating)	-0.26	0.795	+0.20	0.839
S.Seoul price-policy(cooling)	+0.08	0.937	-0.02	0.981
S.Seoul price-policy(heating)	-0.91	0.364	-0.10	0.919

¹⁰ Granger causality is a measure of predictability into the future. Given two variable x and y, x is said to Granger cause y if lagged x predicts current y statistically significantly controlling for current x and lagged y.

4.2 Effect of external environment variables: Research question 2

The results of regression analysis are very similar across all three estimations (national, southern Seoul, northern Seoul). The jeonse (deposit), which is an unusual and very important feature of South Korean housing, has a large, statistically significant positive effect in all cases. The result of regression showed that if the price of jeonse (deposit) goes up, housing prices increase by shifting the demand for jeonse (deposit) into that for housing purchase. This finding is consistent with those that Jo & Kim (2012) drew at ‘An Empirical Study on the Policy Lag in the Housing Policy’. The unemployment rate has a large, statistically significant negative effect nationally. The unemployment rate reduces, as expected, the rate of growth in housing prices as current income is reduced by unemployment. The standard interest rate matters only in northern Seoul. Most Korean people rely greatly on a mortgage when they buy a house,¹¹ as American people do. Less wealthy people live in northern Seoul. So it seems that they are more sensitive to the change of interest rate. On the other hand, the stock prices matter only in southern Seoul. Wealthier people live in the south, the stock prices matter more, the interest rate matters less, the increase in house prices is greater, and the variance is much greater. Neither of CPI and exchange rate matter in the equation. CPI and exchange rate are not close to having statistically significant effects. It was evaluated that housing price increases was one of major factors that brought out inflation because housing prices continued to go up in the past decade. But, there is no statistical evidence to verify that. And notwithstanding the possibility that exchange rate matter through foreign purchase of housing, there is no evidence here to support that.

¹¹ The scale of mortgage in South Korea amounts to 413 billion dollars (the Bank of Korea, Mar. 11, 2015). This is larger than Korea’s yearly national budget (375 billion dollar, 2015).

Table 7. Results of regression analysis

	Estimated coefficient (p-value)					
Variables	Interest rate	D of Jeonse	D of CPI	Unemployment rate	D of Stock price	D of Exchange rate
Whole country	.0519 (0.451)	.5605 (0.000)	.0289 (0.539)	-.2302 (0.000)	.4998 (0.079)	.1586 (0.753)
Northern Seoul	.2002 (0.041)	.5008 (0.000)	-.0324 (0.608)	-.1844 (0.100)	-.1296 (0.720)	-.5477 (0.396)
Southern Seoul	.1583 (0.236)	.9168 (0.000)	.0445 (0.651)	-.2656 (0.157)	1.4030 (0.030)	.6731 (0.556)

4.3 Effect of time lag: Research question 3

Quarter effects are absent everywhere, so there is no seasonality in the housing market. Consecutive months are highly correlated, as the correlation of residual housing price change in consecutive months is 0.66 to 0.74 in all estimations. This is the autocorrelation discussed above. It is controlled in the estimation.

Lagged, the policy dummies do not predict as expected. They are never statistically significant, and the attempt to cool the overheated housing market never seems to have the desired negative effect at all. Further lags do not find any effect, either. This could be a result of measuring the policy with a dummy variable, but that can only explain weak results, not the failure to find any cooling effect. This search finds no useful effect of these policies as is seen at table 5.

5. Conclusion and recommendations

The South Korean government has implemented several policies to adjust the housing market for a long time. Recently the South Korean government has consistently executed housing policies for housing market activation. This study tried to analyze whether housing policies have the intended effects on the housing market or not, using data about the change in housing prices in South Korea from January 2000 to January 2015 (181 months) and controlling for other factors.

According to the result of analysis, even though the South Korean government has executed many housing policies, there is no statistical evidence that housing policies achieved the intended objective. The criticism that housing policies have neither activated nor stabilized the housing market can be true to some extent. The Government should make policies after analyzing accurately the condition of the housing market to achieve an intended effect. And although government makes an accurate policy, it will be useless if it is not executed on time. If an accurate policy is not executed on time, it can be a cause of disturbance in housing market, not stabilize or activate housing market.

The housing policies might not have an intended effect on housing market because government has uniformly executed housing policies without considering the regional characteristics of housing market. The factors that affect the housing market vary considerably by region as is seen in the results of regression analysis. So, it is needed that government executes housing policy that is fit for the regional characteristics.

There is a limit that this study does not consider housing policy instruments specifically and used only dummy variables. If tax system, transaction regulation, and so on were

considered specifically, the analysis might produce more accurate results. Nevertheless, it is meaningful that this study found that there was no statistical evidence that housing policies had an intended effect on housing market and factors that affected housing market varied according to the region.

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Appendix

Table A-1. The classification of housing policies

	'00	'01	'02	'03	'04	'05	'06	'07
Jan.	dummyu	dummyu	dummyd	dummyd	dummyd	dummyd	dummyd	dummyd
Feb.	-	-	dummyd	dummyd	dummyd	dummyd	dummyd	dummyu
Mar.	-	dummyu	-	-	dummyd	-	dummyd	dummyu
Apr.	-	dummyu	dummyu	dummyd	dummyd	dummyd	dummyd	-
May	dummyd	dummyu	dummyu	dummyd	dummyd	dummyd	dummyd	-
June	-	-	-	-	dummyd	-	dummyd	-
July	Dummyu	dummyu	dummyd	-	-	-	-	-
Aug.	dummyu	dummyu	dummyd	dummyd	dummyu	dummyd	dummyd	-
Sep.	-	dummyu	dummyd	dummyd	dummyd	dummyd	-	-
Oct.	dummyu	dummyd	dummyd	dummyd	-	-	dummyd	-
Nov.	dummyu	dummyd	dummyd	-	dummyd	dummyu	dummyd	-
Dec.	-	-	-	-	-	dummyd	dummyd	dummyu
	'08	'09	'10	'11	'12	'13	'14	'15
Jan.	-	dummyu	-	-	-	-	dummyu	-
Feb.	-	dummyu	-	dummyu	-	-	-	
Mar.	dummyu	dummyu	-	dummyu	-	-	-	
Apr.	-	dummyu	dummyu	-	-	dummyu	dummyu	
May	-	dummyu	-	dummyu	dummyu	-	-	
June	dummyu	dummyu	-	-	dummyu	-	-	
July	-	-	-	-	-	dummyu	dummyu	
Aug.	dummyu	dummyu	dummyu	dummyu	-	dummyu	-	
Sep.	-	-	-	dummyu	dummyu	-	dummyu	
Oct.	dummyu	dummyu	-	dummyu	-	-	dummyu	
Nov.	dummyu	-	-	dummyu	-	-	-	
Dec.	dummyu	-	-	dummyu	-	dummyu	-	

Table A-2. The change (%) in housing prices nationally

	'00	'01	'02	'03	'04	'05	'06	'07	'08	'09	'10	'11	'12	'13	'14
Jan.	0.32	-0.11	2.61	-0.08	-0.41	-0.28	0.33	0.87	0.28	-0.55	0.13	0.47	0.16	-0.05	0.11
Feb.	0.43	0.32	2.54	0.5	0.2	0.32	0.45	0.36	0.31	-0.25	0.29	0.8	0.17	-0.06	0.16
Mar.	0.42	0.64	2.3	0.74	0.2	0.38	0.64	0.18	0.76	-0.17	0.25	0.97	0.15	-0.05	0.28
Apr.	0.11	0.63	0.99	0.9	0.17	0.58	0.88	0.13	0.87	0.06	0.19	0.82	0.11	0	0.21
May	-0.11	0.73	0.62	1.63	-0.02	0.54	1.02	0.03	0.61	0.11	0.05	0.7	0.05	-0.01	0.07
June	-0.32	0.83	0.44	0.72	-0.26	0.82	0.48	0.14	0.6	0.19	0.01	0.49	-0.04	-0.04	0.07
July	0	1.24	0.97	0.22	-0.27	0.83	0.21	0.26	0.39	0.27	-0.09	0.41	-0.11	0	0.09
Aug.	0.21	1.93	1.74	0.33	-0.4	0.36	0.24	0.19	0.2	0.32	-0.05	0.49	-0.1	-0.04	0.13
Sep.	0.21	1.6	2.4	0.84	-0.21	0.24	0.48	0.26	0.23	0.72	0.1	0.55	-0.15	0.05	0.27
Oct.	0.11	0.49	0.5	1	-0.24	-0.03	1.35	0.26	-0.05	0.38	0.21	0.4	-0.11	0.2	0.29
Nov.	-0.32	0.39	0.08	-0.36	-0.44	-0.01	3.1	0.27	-0.4	0.25	0.38	0.4	-0.08	0.17	0.2
Dec.	-0.63	0.78	0.17	-0.83	-0.42	0.19	1.86	0.14	-0.72	0.14	0.41	0.17	-0.07	0.19	0.18

Table A-3. The change (%) in housing prices in northern Seoul

	'00	'01	'02	'03	'04	'05	'06	'07	'08	'09	'10	'11	'12	'13	'14
Jan.	0.32	-0.32	1.69	-0.17	0	-0.31	0.24	2.01	1.18	-0.47	0.07	0.05	-0.06	-0.21	-0.01
Feb.	0.54	0.75	2.54	-0.08	0.28	0.2	0.31	0.62	0.92	-0.33	0.14	0.14	-0.05	-0.15	0.08
Mar.	0.1	0.42	1.81	0.77	0.3	0.29	0.51	0.55	2.03	-0.28	0.09	0.24	-0.08	-0.21	0.12
Apr.	0.43	0.53	1.12	0.51	0.2	0.17	0.67	0.5	2.38	0.17	-0.11	0.08	-0.16	-0.08	0.06
May	0	0.63	1.11	0.76	-0.02	0.29	0.67	0.35	1.1	0	-0.17	0.05	-0.12	-0.15	-0.01
June	0	0.63	0.45	0.16	-0.1	0.33	0.59	0.45	0.99	0.26	-0.34	0.01	-0.16	-0.17	-0.04
July	0.1	0.93	1.64	0.19	-0.26	0.67	0.37	0.65	0.54	0.48	-0.3	-0.06	-0.34	-0.23	-0.01
Aug.	0.32	1.96	1.52	0.04	-0.34	0.61	0.51	0.36	0.18	0.46	-0.33	-0.02	-0.18	-0.27	0.01
Sep.	0.21	1.62	2.2	0.673	-0.28	0.53	0.65	0.62	0.27	0.95	-0.22	-0.07	-0.32	-0.03	0.15
Oct.	0.21	0.1	1.03	0.77	-0.31	0.21	1.53	0.63	0.02	0.51	-0.14	-0.01	-0.37	0.04	0.16
Nov.	-0.31	-0.19	0	-0.26	-0.3	0.1	4.06	0.93	-0.29	0.11	-0.06	-0.03	-0.23	-0.02	0.12
Dec.	-0.53	0.39	0.08	-0.48	-0.37	0.09	3.82	0.63	-0.89	0.04	0	-0.1	-0.16	0.01	0.04

Table A-4. The change (%) in housing prices in southern Seoul

	'00	'01	'02	'03	'04	'05	'06	'07	'08	'09	'10	'11	'12	'13	'14
Jan.	0.51	0.09	5.35	-1.11	-0.4	-0.26	0.97	1.09	0.21	-0.87	0.14	0.23	-0.11	-0.25	0.04
Feb.	1.12	0.58	3.89	0.66	0.7	1.01	1.2	0.22	0.4	0.08	0.33	0.36	-0.12	-0.19	0.1
Mar.	1.41	0.78	3.51	0.72	0.71	0.39	1.82	0.18	0.84	-0.11	0.07	0.21	-0.16	-0.17	0.2
Apr.	0.1	0.77	1.25	1.83	0.58	1.21	2.34	-0.02	0.88	0.35	0	0.02	-0.37	-0.06	0.03
May	0	1.53	0.72	2.31	0.17	0.94	2.16	-0.17	0.59	0.17	-0.25	-0.02	-0.18	0	0
June	0	1.79	0.72	0.94	-0.38	2.4	0.8	0.1	0.36	0.49	-0.33	-0.07	-0.23	-0.11	-0.08
July	0.69	2.23	2.22	0.87	-0.34	2.03	0.3	0.36	0.21	0.81	-0.38	-0.12	-0.48	-0.24	0.01
Aug.	0.59	3.27	3.37	1.31	-0.68	0.24	0.24	0.25	0.23	0.6	-0.36	-0.02	-0.37	-0.11	0.04
Sep.	0.88	2.02	4.15	2.3	-0.38	0.24	0.87	0.23	0.1	1.28	-0.13	0.02	-0.53	0.01	0.27
Oct.	0.48	0.34	-0.19	2.21	-0.48	-0.2	2.32	0.19	-0.25	0.44	-0.1	-0.06	-0.36	0.09	0.24
Nov.	-0.58	0.68	-0.32	-1.01	-0.53	0.26	5.41	0.04	-0.75	0.04	-0.03	-0.13	-0.27	0	0.06
Dec.	-0.87	2.13	0	-0.9	-0.5	0.71	2.22	0.02	-1.56	0.01	0.1	-0.12	-0.33	-0.01	-0.03